

Investigation of Remote Sensing Imagery for the Philippine Waters

Christopher R. Jackson
Global Ocean Associates
6220 Jean Louise Way
Alexandria, VA 22310
phone: (703) 822-9760 fax: (703) 822-9754 email: goa@internalwaveatlas.com

Award Number: N00014-07-M-0354
<http://www.internalwaveatlas.com>

LONG-TERM GOALS

The long term goal of the project is to enhance our understanding of the oceanographic processes and features arising in and around straits, and improve our capability to predict the spatial and temporal variability of these regions.

OBJECTIVES

The principal objective is to characterize the type and distribution (geographic and temporal) of oceanographic signatures visible in remote sensing imagery around the Philippine Archipelago.

APPROACH

The effort made use of historical synthetic aperture radar (SAR) and optical imagery to identify the features in the Philippines straits. These data were then combined with data collected in support the field programs undertaken in 2007, 2008 and 2009.

WORK COMPLETED

Over 150 historical SAR images were obtained from the European Space agency and the Alaska Satellite Facility and were examined for oceanographic features. Feature locations were tagged and input into Google Earth for dissemination among team members and to support the PhilEx cruises. SAR data acquisition planning was done with cruise scientists and CSTARS at the University of Miami for 2008 and 2009. More than 150 images were obtained during the cruise periods and were obtained/analyzed and disseminated in near real time to support the cruise operations. SAR imagery was also converted to wind speed imagery and disseminated for both near real time and post cruise analysis.

RESULTS

A large number of oceanographic features were identified around the Philippine Archipelago. These included both current and flow features as well as natural slicks, eddies, wind features and a large number of fine scale internal wave occurrences. Internal wave were noted between Palawan and Panay

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 2009		2. REPORT TYPE		3. DATES COVERED 00-00-2009 to 00-00-2009	
4. TITLE AND SUBTITLE Investigation of Remote Sensing Imagery for the Philippine Waters				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Global Ocean Associates,6220 Jean Louise Way,Alexandria,VA,22310				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 3	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

as well as to the southwest of the two straits (San Bernadino and Serigao) open to the Pacific Ocean. More than Strong wind signatures dominated many of the images acquired during the Winter Moonsoons season in both 2008 and 2009.

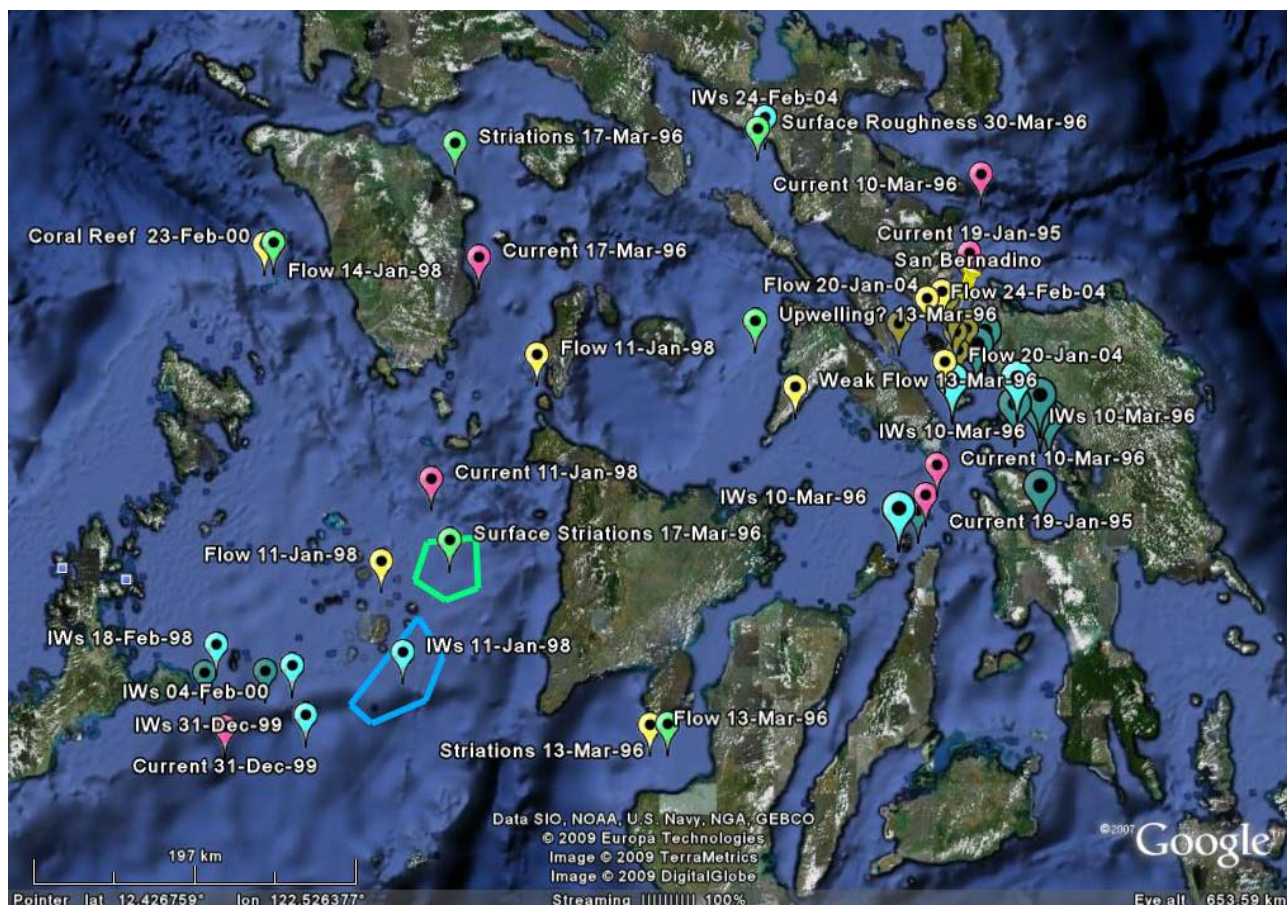


Figure 1. The locations of oceanographic signatures noted in historical synthetic aperture radar imagery in and around the northern half of the Philippine Archipelago.

A brief summary of the dominant Philippines ocean features broken down by region is

- San Bernadino Strait
 - persistent current signatures, internal waves.
- Dipolog Area
 - devoid of any oceanographic features
- Surigao Strait
 - Currents, internal waves and an unusual ripple pattern on the eastern side
- Mindoro/Tablas
 - Wind and gap flow features, internal waves between the Cuyo Islands and Panay, natural slicks along the west coast of Mindoro, flow feature are visible to the southwest of Mindoro (suloids, vortexes)

Cruise participants reported that the near real time processing and dissemination was very useful to planning the in situ observations.

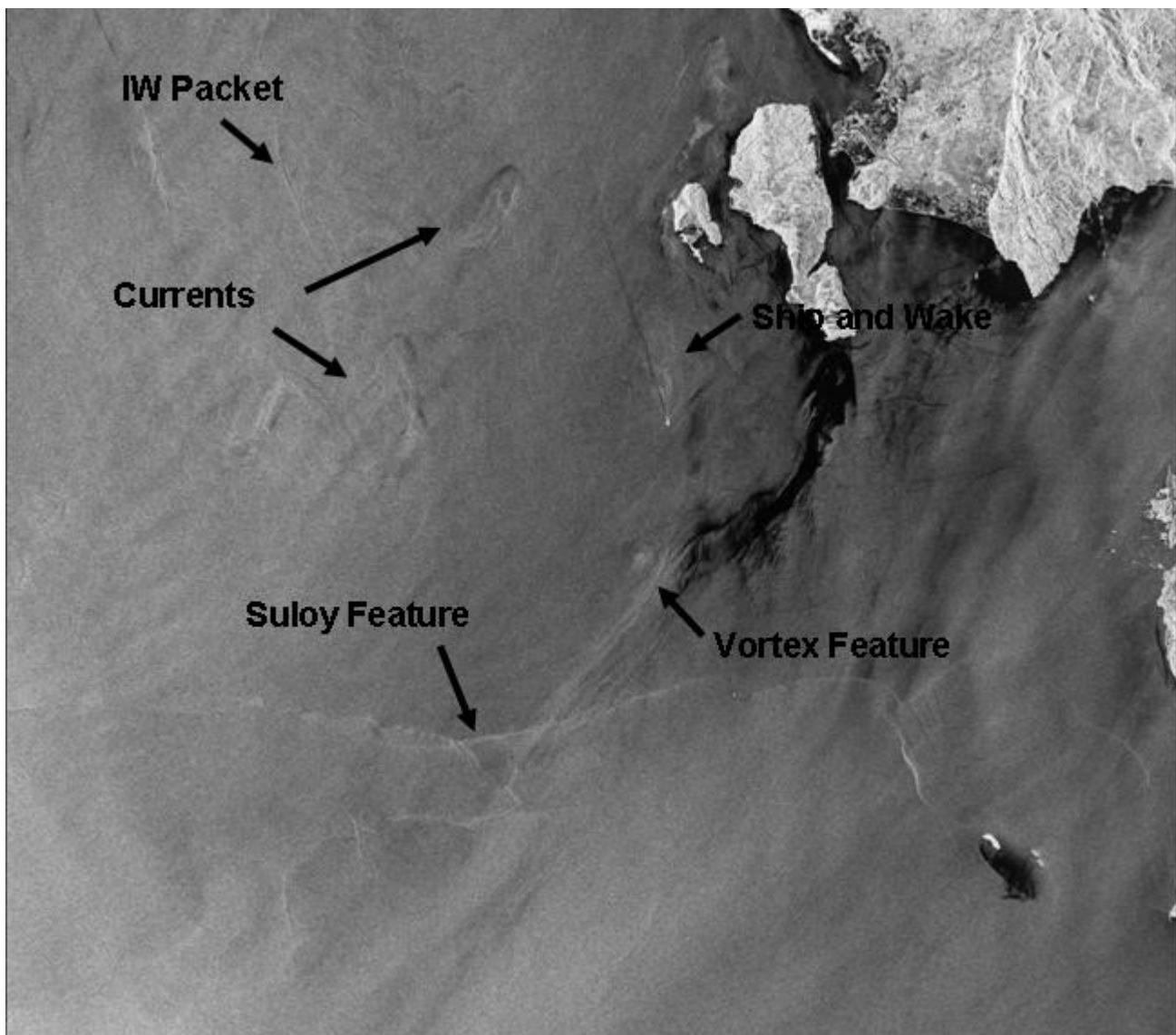


Figure 2. Portion of an Envisat SAR image acquired southwest of Mindoro Island on 23 February 2008. The image shows a variety of oceanographic features including internal waves, currents, a suloy, vortex and ship wake.

RELATED PROJECTS

Work done under N00014-05-C-0190 and N000014-08-C-0215 for the Development of a Nonlinear Internal Wave Tactical Decision Aid was used to produce a prediction of the location of nonlinear solitary waves in the Sulu Sea for investigation as part of the 2009 PhilEx Cruise.